PIN HR-17773 – TIN BRONZE – LATE BRONZE AGE – SWITZERLAND

Artefact name	Pin HR-17773
Authors	Naima. Gutknecht (HE-Arc CR, Neuchâtel, Neuchâtel, Switzerland) & Rémy. Léopold (HE-Arc CR, Neuchâtel, Neuchâtel, Switzerland) & Domon Beuret. Emmanuelle (Laténium, Neuchâtel, Neuchâtel, Switzerland)
Url	/artefacts/1090/

The object

Credit Laténium, C.Cevey.

Fig. 1: Pin with decorated head and round section,

Credit HE-Arc CR, L.Rémy.

Fig. 2: Brown-yellow corrosion products (detail) around the head of the pin,

Credit HE-Arc CR, L.Rémy.

Fig. 3: Brown-yellow corrosion products (detail) on the middle part of the pin,

Fig. 4: Brown-yellow and green corrosion products (detail) in an area close to the tip of the pin,

Credit HE-Arc CR, L.Rémy.

Description and visual observation

Description of the artefact	Pin with decorated head and round section. It has brown-yellow green and corrosion products (Figs. 1-4). Dimensions: L = 6.2cm; WT = 2.6g.
Type of artefact	Jewellery
Origin	Hauterive - Champréveyres, Neuchâtel, Neuchâtel, Switzerland
Recovering date	Excavation 1983-1985, object from layer 1
Chronology category	Late Bronze Age
chronology tpq	1050 B.C.
chronology taq	800 B.C.
Chronology comment	Hallstatt A2/B
Burial conditions / environment	Lake
Artefact location	Laténium, Neuchâtel, Neuchâtel
Owner	Laténium, Neuchâtel, Neuchâtel
Inv. number	HR-17773
Recorded conservation data	The object has been kept in wooden storage, no intervention documented.

Complementary information

The object was analyzed in 1987 by Schweizer. Documentation of the strata in binocular mode of the object was performed in 2022.

Study area(s)

Fig. 5: Sides A and B (opposite sides) of the pin showing the XRF analysis areas (red circles),

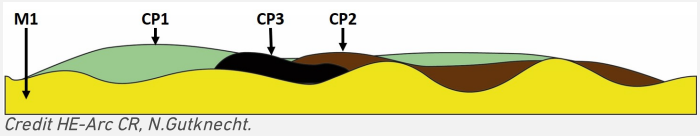
Credit HE-Arc CR, L.Rémy.

Binocular observation and representation of the corrosion structure

The schematic representation below gives an overview of the corrosion structure encountered on the pin from a first visual macroscopic observation.

Strata	Type of stratum	Principal characteristics
CP1	Corrosion product	Light green, thin, discontinuous, non compact, very soft
CP2	Corrosion product	Brown, thin, discontinuous, compact, hard
CP3	Corrosion product	Black, thin, discontinuous, compact, hard
M1	Metal	Yellow, thick, metallic, soft

Table 1: Description of the principal characteristics of the strata as observed under binocular and described according to Bertholon's method.



Credit HE-Arc CR, N.Gutknecht.

Fig. 6: Stratigraphic representation of the corrosion structure of the pin by macroscopic and binocular observation using the Micorr application with reference to Fig. 7,

MiCorr stratigraphy(ies) – Bi

Fig. 7: Stratigraphic representation of the corrosion structure of the pin observed macroscopically under binocular microscope using the MiCorr application with reference to the whole Fig. 6. The characteristics of the strata, such as the discontinuity, are accessible by clicking on the drawing that redirects you to the search tool by stratigraphy representation, Credit HE-Arc CR, N.Gutknecht.

Sample(s)

Description of sample No sample has been taken. The observation and analysis were performed directly on the object.

Alloy Tin Bronze

Technology None

Lab number of sample 85-27

Sample location None

Responsible institution None

Date and aim of sampling

Complementary information

None.

Analyses and results

Analyses performed:

Non-invasive approach

XRF with handheld portable X-ray fluorescence spectrometer (NITON XL5). General Metal mode, acquisition time 60s (filters: Li20/Lo20/M20).

Non invasive analysis

XRF analysis of the pin was carried out on three representative areas of the surface (Fig. 5). Points 1 and 3 were done on yellow areas which seem to be close to the remaining metal, while point 2 was performed on the brown corrosion layer (CP2) where all strata (soil, corrosion products, and metal) are analyzed at the same time.

Table 2 shows that the metal is presumably a tin bronze alloy with possibly some lead. The other elements detected are: Si, S, Fe and P.

Elements (mass %)	Cu		Sn		Si		S		Pb		Fe		P		
	%	+/- 2σ	%	+/- 2σ	%	+/- 2σ	%	+/- 2σ	%	+/- 2σ	%	+/- 2σ	%	+/- 2σ	Total
1	82.0	0.1	14.0	0.06	1.5	0.07	0.6	0.02	0.5	0.02	0.4	0.02	0.3	0.03	99.3
2	81.0	0.1	14.0	0.05	0.6	0.06	1.5	0.03	0.5	0.02	1.5	0.02	0.3	0.02	99.4

3	81.5	0.14	14.1	0.06	1.6	0.08	0.7	0.03	0.6	0.02	0.5	0.02	0.7	0.04	99.7

Table 2: Chemical composition of the surface of the pin at three representative areas shown in Fig. 5. Method of analysis: XRF.

Metal

None.

Microstructure	None
First metal element	Cu
Other metal elements	Sn

Complementary information

None.

Corrosion layers

None.

Corrosion form	None
Corrosion type	None

Complementary information

In the article "Bronze objects from Lake sites: from patina to bibliography" (Schweizer 1994), the corrosion products of the pin 17773 (LAB MAH 85-27) were studied through XRD. The results show that the pin contains copper carbonate (malachite) and copper sulfate (posnjakite), both of these minerals are green.

MiCorr stratigraphy(ies) – CS

Synthesis of the binocular / cross-section examination of the corrosion structure

The corrosion structure has only been documented in binocular mode (Fig. 7).

Conclusion

The pin is made from a tin bronze, possibly containing some lead and is covered with brown and green corrosion products. The corrosion products identified by Schweizer seem to indicate that they developed in terrestrial environment.

References

References on object and sample

Object files in MiCorr

1. MiCorr_Pin or needle fragment HR-3031
2. MiCorr_Tang fragment of a knife HR-6567
3. MiCorr_Tang fragment of a knife HR-6246
4. MiCorr_Pin HR-18152
5. MiCorr_Pin HR-3071
6. MiCorr_PIN HR-18603
7. MiCorr_Pin HR-3389

References object
8. Rychner-Faraggi A-M. (1993) Hauterive – Champréveyres 9. Métal et parure au Bronze final. Archéologie neuchâteloise, 17 (Neuchâtel).
9. Hochuli, S. et al. (1988) SPM III Bronzezeit , Verlag Schweizerische Gesellschaft für Ur- und Frühgschichte Basel, 76-77, 379.

References sample
10. Empa Report 137 695/1991, P.O. Boll.
11. Rapport d'examen, Lab. Musées d'Art et d'Histoire, Geneva GE, 87-194 à 87-197.
12. Schweizer, F. (1994) Bronze objects from Lake sites: from patina to bibliography. In: Ancient and historic metals, conservation and scientific research (eds. Scott, D.A., Podany, J. and Considine B.B.), The Getty Conservation Institute, 33-50.

References on analytic methods and interpretation

13. Robbiola, L., Blengino, J-M., Fiaud, C. (1998) Morphology and mechanisms of formation of natural patinas on archaeological Cu-Sn alloys, Corrosion Science, 40, 12, 2083-2111.